

BOX 1 | Defining the Word “Seamount”

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Reading through this issue of *Oceanography*, it will become apparent that researchers in different disciplines see their seamounts in quite different ways. The term seamount has been defined many times (e.g., Menard, 1964; Wessel, 2001; Schmidt and Schmincke, 2000; Pitcher et al., 2007; International Hydrographic Organization, 2008; Wessel et al., 2010) but there is no “generally accepted” definition. Instead, most definitions serve the particular needs of a discipline or a specific paper. Inconsistencies are common among different publications and, most notably, differ from the recommendations of the International Hydrographic Organization and International Oceanographic Commission (International Hydrographic Organization, 2008). It is not the goal of this note to arbitrate or remedy these inconsistencies. However, as seamount researchers begin to coalesce into one broad, multidisciplinary research community, it is important to: (1) have a simple definition that explains which features are included under the umbrella of seamount research and which are not, providing an essential condition for defining the seamount research community, and (2) respect and be aware of differences among disciplinary definitions, as they may stand in the way of consistently applying one disciplinary data set to another.

Authors in this issue of *Oceanography* belong to a spectrum of science disciplines that studies seamounts, ranging from geosciences to biological sciences. Geoscientists define seamounts as constructional features, so that formation processes are at the heart of their views and definition. Biologists define seamounts as habitats that are controlled by specific ocean environments, including the shape and summit depth of the feature studied. We combine these diverse perspectives under one inclusive umbrella definition that describes seamounts as

any geographically isolated topographic feature on the seafloor taller than 100 m, including ones whose summit regions may temporarily emerge above sea level, but not including features that are located on continental shelves or that are part of other major landmasses.

It is the nature of an umbrella definition to use the broadest and most general description that cumulatively covers all features studied under the term seamount. This definition is useful for the

community of seamount scientists but it is too broad to serve as an effective functional definition for many disciplinary studies.

As we explore the major differences among definitions of the term “seamount,” several important issues play a role:

- *The inclusion of the temporarily emergent portions of seamounts* is relatively obvious for geologists who look at seamount construction over long time scales. Many large seamounts either have summit regions that currently breach sea level, or at some point they emerged and are now entirely submerged. Hence, temporary emergence is part of the life cycle of many very large seamounts. The inclusion of emerged summits, however, is counter intuitive for a biologist. Biological communities on land are dramatically different from submerged communities and, hence, data from the emerged fractions of a seamount cannot be reasonably included into a focused marine biological study. The complexity of this issue is illustrated by Lō`ihi Seamount (see Spotlight 3 on page 72 of this issue [Staudigel et al., 2010]), an entirely submerged seamount that is located on the submarine flank of Mauna Loa, the largest volcano of the Hawaiian Islands.
- There is much discussion about the *minimum size cutoff of a feature to warrant the use of the term seamount*. Menard (1964) originally suggested 1000 m as a minimum size, recognizing that under some circumstances, it is difficult to distinguish some smaller seamounts from seafloor roughness. The same 1000-m-height requirement is also included in the definition of the International Hydrographic Organization and International Oceanographic Commission (International Hydrographic Organization, 2008). However, there are a large number of named seamounts that are much smaller than 1000 m (e.g., Axial Seamount; see Spotlight 1 on page 38 of this issue [Chadwick et al., 2010]), and much of the current literature on the geology of seamounts proposes 100 m as a lower cutoff (Smith and Cann, 1992; Schmidt and Schmincke, 2000). This cutoff was chosen because features of this size can be recognized as individual volcanoes in most cases. Smaller features may be called knolls, abyssal hills, abyssal peaks (International Hydrographic Organization, 2008), pinnacles, or pillars (Harris, 2007). It is also interesting to note that many smaller seamounts may be completely buried by sediments

over geological time. Such buried seamounts cease to exist as a seafloor bathymetric features and, hence, they do not exist for oceanographers, biologists, and fisheries scientists. Yet, they may still present a significant gravity anomaly, so Wessel et al. (2010) include them in the seamount count and they remain significant features for geologists or geochemists who study their subduction and fluid flow.

- Some seamount definitions also include aspects of their shape, in particular, restricting their use to conical features, whereby flat-topped ("tablemount") seamounts are commonly called guyots. This morphological distinction is significant insofar as flat-topped seamounts are likely to once have been islands or coral reefs, while conical ones are likely to not to have breached the sea surface during their life cycle (Staudigel and Clague, 2010).
- In their original definition, seamounts were defined based on their tectonic setting, specifically, as features on the seafloor that are not part of mid-ocean ridges or subduction zones (Menard, 1964). This limitation to intraplate volcanoes pays tribute to the distinct magmatic processes that form volcanoes at mid-ocean ridges, arc volcanoes, and in intraplate settings. Apparent exceptions are mantle hotspots located at or close to mid-ocean ridges, such as the one presumed to exist under Axial Seamount at the Juan de Fuca Ridge (see Spotlight 1 on page 38 of this issue [Chadwick et al., 2010]) that appears to be the origin of the Cobb seamount chain. Wessel et al. (2010) restrict their use of the term seamount to intraplate features, excluding arc volcanoes in their seamount count.

Although the above examples are not meant to be comprehensive, they demonstrate that there are important nuances in the way the term seamount is used in different seamount science disciplines. Those differences have to be considered when correlating data from one discipline to another, and much care has to

be applied when working in such an interdisciplinary context. We emphasize that our umbrella definition is useful in defining what seamount sciences are about, but it does not replace the definitions used by individual science disciplines.

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